**KP EOS Calculator: Frequently Asked Questions**

**5/11/2021 update**

**Use of the calculator for research or presentations:**

The calculator is open source. Please attribute appropriately.

**Will you provide the calculator in the form of an Excel doc?**

We provided this in the past, but we no longer plan to do so.

**Is there an iPhone app?**

There is no iPhone app developed by the authors of the calculator. We recommend using the website on your phone or desktop, as it was developed to be screen adaptive.

**Based on Kaiser Permanente Northern California’s Experience**

**Are you using the EOS Risk at Birth Score or the EOS Risk after Clinical Exam for all your newborns?**

We use the EOS risk after clinical exam.  In addition, we use the cut-offs for blood culture and antibiotics as described in the attached paper.  Essentially, we follow the output from the EOS calculator.  The EOS risk at birth is used to determine the frequency of vitals.  If the EOS risk score at birth is >1/1000, we do every 4 hour vitals

**Are you using it for all deliveries from 34-43 weeks gestation?**

Yes.

**If you are using the clinical exam, who makes that assessment for every newborn?**

If a pediatrician sees the infant after birth immediately, then the pediatrician.  Otherwise, we do rely on our postpartum nurses.  They have a low threshold for notifying the pediatrician if there is any respiratory distress and will notify the pediatrician with any vitals that would qualify the infant for "equivocal" status.

**Are you using the Classification of Infant's Clinical Presentation for the first several hours after birth, for the first 24 hours or for the entire hospital stay?**

For the 1st 24 hours. The clinical presentations are validated with data from the 1st 12 hours after delivery.  We expanded this to 24 hours after delivery in the practical application of the calculator to be more conservative and capture changes in the clinical status that were occurring later, although some of these may have been from other etiologies.

In our analysis the majority of the outcomes occurred early (1st 12 hours of age), so the accuracy of the calculator between 12 and 24 hours of age is actually difficult to estimate (see page 13 of supplement to **Escobar et al. (2014)1,** where we pointed out that we could not find any meaningful patterns after 12 hours of age); also note that ~85% of all cases were detected prior to 12 hours. That being said, it is also the case that asymptomatic status remains a very strong predictor across all ages.

**For instance, what do you do for a previously well-appearing baby who is being observed, with or without a blood culture, who develops tachycardia (HR >160) starting at 12 hours of age and continues for the next 4 hours? He is now in the "equivocal" group. Do you recalculate and use the risk score for an equivocal baby and treat with antibiotics if recommended as per the risk score?**

We would then use the equivocal recommendation.  It is essential that we use all the information in the 1st 24 hours and recalculate risk if the infant's clinical status changes

**Are you getting CBCs or other tests (CRP, calcitonin) to evaluate risk for sepsis at any time during the hospitalization?**

We are not using either regularly.

In general, we do not find the CRP helpful unless we are using it to stop antibiotics early say in a symptomatic infant who has a negative blood culture who we may have treated for 7 days as "culture negative" sepsis but with reassuring CRPs decide to stop early.  We don't use it to rule anyone in.  We don't use it in asymptomatic infants or infants whose symptoms have resolved. Studies have shown its poor positive predictive value and we find that when clinicians get it, they often respond to values that may be mildly elevated in an incorrect way, putting too much emphasis on a result that doesn't really alter the infant's sepsis risk.

As for CBC’s, they can be used as an additional test to determine EOS risk with the caveat that unless the infant is equivocal in clinical appearance, abnormal CBC's do not tend to alter post-test probability enough to guide decision-making2,3. If you choose to use the WBC and differential for decision-making, we recommend you review the likelihood ratios in references #2 & 3.

**Fever, Antipyretics, Chorio, and Antibiotics**

**Use of routine maternal antipyretics in L&D and EOS Calculator**

In Kaiser Permanente and the Boston hospitals in which the risk prediction models were developed, routine anti-pyretic use was not common.  Being such, if you think that the use of antipyretics is affecting the maximum maternal temperature recorded, the risk prediction model would not perform the same at your institution.  The maximum maternal temperature is an important predictor in the model, therefore, use of antipyretics to reduce max temperature will artificially decrease the calculated risk.

**Maternal Fever Post-Delivery**

The calculator was developed using only temperatures pre-delivery.  However, it is reasonable and makes clinical sense to use a maternal fever that occurs within one hour after delivery.  (Sometimes a mother may not have had a temperature recorded for a long-time prior to delivery and thus we may have missed an elevated temperature pre-delivery.)  We always want to err on the side of caution and be conservative.  This practice will increase the risk scores of infants with postpartum fever which seems like the right thing to do.  Although this was not evaluated specifically in the risk prediction models, this approach seems clinically correct.

**Should the diagnosis of chorioamnionitis confer some additional risk that is not reflected by the calculator?**

When developing the models that are the basis of the calculator, one of our explicit goals was to accurately estimate risk of EOS without use of the obstetric diagnosis of chorioamnionitis. The clinical diagnosis of chorioamnionitis is subjective and is applied with considerable variability from hospital to hospital and among providers in a given hospital. The objective data provided by maximum maternal temperature and the duration of ruptured membranes correlate with the diagnosis of chorioamnionitis. etiology.  There are exceptional cases. If an infant’s mother is bacteremic and hypotensive, you are probably going to evaluate and treat the infant regardless of the risk estimate.

**Definition of Adequate GBS Intrapartum Antibiotic Prophylaxis**

National recommendations concerning the definition of adequate GBS IAP prophylaxis have evolved since the development of the EOS calculator. We recommend following the guidance, outlined in the 2019 AAP COFN GBS Guidelines4.

**Penicillin G, Ampicillin, and Cefazolin:** Group B streptococci remain susceptible to β-lactam antibiotics, and penicillin G and ampicillin are the antibiotics best studied for prevention of neonatal infection. Cefazolin is recommended for GBS IAP for women with a penicillin allergy who are at low risk for anaphylaxis and has similar pharmacokinetics and mechanisms of action as ampicillin.

**Clindamycin and Vancomycin:** Per AAP: “Current data support the use of clindamycin and vancomycin as alternative medications for GBS IAP when maternal allergy precludes the use of b-lactam antibiotics. These medications are likely to provide some protection against GBS infection for both mother and newborn infant when antimicrobial susceptibility testing supports the use of these second-line agents.” However, “When using these models [the calculator], only penicillin, ampicillin, or cefazolin should be considered as “GBS-specific antibiotics.” The administration of clindamycin or vancomycin alone for IAP for any duration is currently recommended to be entered as **“no antibiotics.”**

**Timing of Antibiotics**

From the risk models, there are actually only three different coefficients for antibiotics.

Category adjusted OR

None (ref)

Any GBS or Broad abx <4 hours 0.35

Broad > 4 0.31

When we adopted the calculator for clinical use, we added in the caveat of “at least two hours prior to delivery.”  While there is evidence of some usefulness even an hour prior to delivery, we didn't want to include antibiotics given just a few minutes before delivery.  Despite our large cohort, there weren't enough outcomes in the dataset and variation in antibiotic practice to accurately assess risk reduction for antibiotic by hour prior to delivery.

**Should I consider a single dose of Amp given within 2 hours of delivery as “GBS specific” if it was intended to be Amp & Gent for broad spectrum coverage.   There are some institutions who are opting to consider this “No antibiotics” if the intention was broad spectrum but the timing did not allow.  What are your thoughts on this?**

Between choosing broad spectrum 2-3.9 hours prior to delivery or GBS specific > 2 hours prior to delivery - the model uses the same coefficient - so it really doesn't matter.

**Which selection should I make in the case that GBS specific antibiotics were given, and then broad spectrum in response to maternal fever?**

**We recommend that you use the broadest-spectrum completed treatment.**

**GBS specific given >2 hours and broad spectrum given <2 hours before delivery:** the only completed treatment is GBS-specific and that should be used in the risk calculation

**GBS specific given >2 hours and broad spectrum given 2-3.9 hours before delivery:** choose broad spectrum 2-3.9 hours (although technically it does not matter).

**GBS-specific given >2 hours and broad-spectrum given >4 hours before delivery:** choose broad spectrum >4 hours

**References**

1. Escobar GJ, Puopolo KM, Wi S, et al. Stratification of risk of early-onset sepsis in newborns >/= 34 weeks' gestation. Pediatrics 2014;133(1):30-6. DOI: 10.1542/peds.2013-1689.

2. Newman TB, Draper D, Puopolo KM, Wi S, Escobar GJ. Combining immature and total neutrophil counts to predict early onset sepsis in term and late preterm newborns: use of the I/T2. Pediatr Infect Dis J 2014;33(8):798-802. DOI: 10.1097/INF.0000000000000297.

3. Newman TB, Puopolo KM, Wi S, Draper D, Escobar GJ. Interpreting complete blood counts soon after birth in newborns at risk for sepsis. Pediatrics 2010;126(5):903-9. DOI: 10.1542/peds.2010-0935.

4. Puopolo KM, Lynfield R, Cummings JJ, Committee On F, Newborn, Committee On Infectious D. Management of Infants at Risk for Group B Streptococcal Disease. Pediatrics 2019;144(2). DOI: 10.1542/peds.2019-1881.